WHAT IS CLAIMED IS:

1. A process for producing 3-hydroxycyclohexanone, which comprises the steps of:

(a) reacting 1,3-cyclohexanedione with

(i)an enzyme having an ability to reduce 1,3-cyclohexanedione to 3-hydroxycyclohexanone,

(ii)a microorganism producing the enzyme defined in (i), or

(iii)a treated material of the enzyme as defined in (i) or of the microorganism defined in (ii), and

(b) recovering resulting 3-hydroxycyclohexanone.

2. A process according to claim 1,wherein

A) said enzyme having the ability to reduce 1,3-cyclohexanedione to 3-hydroxycyclohexanone is an enzyme:

i) derived from a microorganism belonging to a microorganism belonging to the genus *Arthrobacter, Rhodotorula, Bacillus, Pseudomonas, Streptomyces, Candida, Corynebacterium* or *Penicillium*; or

ii) having any one of the following amino acid sequences:

(a) the amino acid sequence set forth in SEQ ID NO:1 or 3,

(b) an amino acid sequence comprising deletion, substitution, or addition of one or more amino acids in the amino acid sequence of SEQ ID NO:1 or 3,

(c) an amino acid sequence encoded by the nucleotide sequence set forth in SEQ ID NO:2 or 4, and

(d) an amino acid sequence encoded by a nucleotide sequence of a DNA that hybridizes under stringency conditions

with DNA complementary to DNA consisting of the nucleotide sequence of SEQ ID NO:2 or 4; or

B) said microorganism producing the enzyme is a transformant having a introduced plasmid containing:

i)a nucleotide sequence of the nucleotide sequence of SEQ ID NO:2 or 4, or

ii) a nucleotide sequence of a DNA that hybridizes under stringency conditions with DNA complementary to DNA consisting of the nucleotide sequence of SEQ ID NO:2 or 4; or

C) said treated material of the microorganism producing the enzyme having an ability to reduce 1,3-cyclohexanedione to 3-hydroxycyclohexanone is dead microbial cells of the microorganism as defined in B) above.

3. A process according to claim 1, wherein 3-hydroxycyclohexanone is optically active 3-hydroxycyclohexanone.

4. A process according to claim 2, wherein the transformant is *Escherichia coli*.

5. A process according to claim 2, wherein the amino acid sequence defined in (ii) the amino acid sequence as set forth in SEQ ID NO:1.

6. A process according to claim 2, wherein the amino acid sequence is the amino acid sequence as set forth in SEQ ID NO:3.

7. A process according to claim 2, wherein the amino acid sequence defined in (ii) is an amino acid sequence encoded by the nucleotide sequence as set forth in SEQ ID NO:2.

8. A process according to claim 2, wherein the amino acid sequence is an amino acid sequence encoded by the nucleotide

sequence as set forth in SEQ ID NO:4.

9. A process according to claim 2, wherein the transformant is a transformant produced by introducing:

the plasmid containing

a nucleotide sequence encoding the enzyme as defined in B) and optionally

a plasmid containing a nucleotide sequence that encodes an enzyme that regenerates a coenzyme on which the enzyme having the ability to reduce 1,3-cyclohexanedione to 3-hydroxycyclohexanone depends.

10. A process according to claim 9, wherein the coenzyme is NADH/NAD^+ (nicotinamide adenine dinucleotide) or NADPH/$NADP^+$ (nicotinamide adenine dinucleotide phosphate).

11. A process according to claim 2, wherein 1,3-cyclohexanedione is allowed to react with the transformant or dead microbial cells thereof in the presence of a fatty alcohol.

12. A process according to claim 11, wherein the fatty alcohol is an alcohol having a boiling point of 200°C or less.

13. A process according to claim 11, wherein the fatty alcohol is 2-propanol.

14. A process according to claim 2, wherein 1,3-cyclohexanedione is allowed to react with the transformant or dead microbial cells thereof in the presence of glucose.

15. Optically active 3-hydroxycyclohexanone.